Advance

SIGNAL GENERATOR

TYPE B4

Including B4A, B4B, B4A/C and B4B/C

INSTRUCTION MANUAL

ADVANCE COMPONENTS LIMITED

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Advance

SIGNAL GENERATOR TYPE B4

(Including B4A: B4B: B4A/C: B4B/C)

THE Advance Type B4 Signal Generator is available in two versions, the B4A and B4B, each providing a wide frequency range with accurate frequency and output voltage calibration.

The frequency ranges are 100 kc/s to 80 Mc/s on B4A, and 30 kc/s to 30 Mc/s on B4B. The accuracy of frequency calibration is ± 1%. A linear scale and vernier are provided to give very close resetting accuracy. Due to the use of a crystal voltmeter followed by our type A.38 high frequency resistive attenuator, the output is measured to ± (1 dB + 2% F.S.D.).

The signal can be modulated internally at 400 c/s from 0 to 80%. External modulation, also 0 to 80%, may be applied up to 30 kc/s into the B4A and up to 10 kc/s into the B4B. Both internal and external modulation depths are monitored.

The instruments are of robust construction and are simple to operate.

SPECIFICATION

FREQUENCY

Frequency ranges.

B4A/C 100 kc/s to 80 Mc/s in 6 ranges. Accuracy ± 1%.

Range A:	100– 300 kc/s.	Range D:	3–10 Mc/s.
Range B:	300–1000 kc/s.	Range E:	10–30 Mc/s.
Range C:	1– 3 Mc/s.	Range F:	30–80 Mc/s.

B4B/C 30 kc/s to 30 Mc/s in 6 ranges. Accuracy ± 1%.

Range A:	30– 100 kc/s.	Range D:	1– 3 Mc/s.
Range B:	100– 300 kc/s.	Range E:	3–10 Mc/s.
Range C:	300–1000 kc/s.	Range F:	10–30 Mc/s.

R.F. OUTPUT VOLTAGE

Accuracy ± (1 dB + 2% F.S.D.).

The output voltage from the 75 ohm attenuator is fed into a 75 ohm transmission line which is terminated with a 75 ohm dummy aerial pad. The output into 75 ohms is continuously variable from 1μV to 100mV by means of a 4-step decade attenuator and a continuously variable control. The signal is monitored after the variable control to ensure accuracy at high frequencies.

OUTPUT IMPEDANCE

The output impedance at the end of the unterminated transmission line is 75 ohms. When terminated by the Termination Pad type TP1A supplied with the instrument, three impedance values are available:—

(1) 37 ohms (with full output).
(2) 10 ohms (with one-tenth indicated output).
(3) A standard dummy aerial (with one-tenth indicated output).

INTERNAL MODULATION

Frequency 400 c/s ± 10%.
Modulation depth 0 to 80%; ± 1 dB ± 2% F.S.D.

EXTERNAL MODULATION

B4A 10 c/s to 30 kc/s, 0 to 80% for frequencies less than 1/30th of the carrier frequency.

B4B 10 c/s to 10 kc/s, 0 to 80% for frequencies less than 1/30th of the carrier frequency.

Approximately 10% modulation depth per volt input into high impedance is obtained. The modulation depth is monitored. Accuracy ± 1 dB.

SPECIFICATION

A.F. OUTPUT

This is obtained from the internal modulation oscillator at approximately 400 c/s. Output is approximately 0 to 10 volts into 600 ohms.

R.F. LEAKAGE

Good screening and filtering have reduced stray radiation to less than 1μV.

ACCESSORIES

Each instrument is supplied with the following:—

1 ECC 91 Mullard valve (6J6)
1 6SN7GT valve
1 6X5GT valve
1 Pilot lamp, type M.E.S. 11 mm, 6·5 volts
1 Termination and Dummy Aerial Pad, type TP1A
1 Shielded R.F. Feeder, complete with plugs, type PL5
1 Shielded A.F. Lead, complete with plug and crocodile clips, type PL18
1 Mains Lead, type PL24

POWER SUPPLY

B4A, B4B: 110, 210, 230, 250 volts 40–100 c/s.
Consumption approximately 25 watts.
A model is also available for 110–125, 140–160, 220 volts 40–100 c/s. and 117 volts 25–60 c/s.

WEIGHT

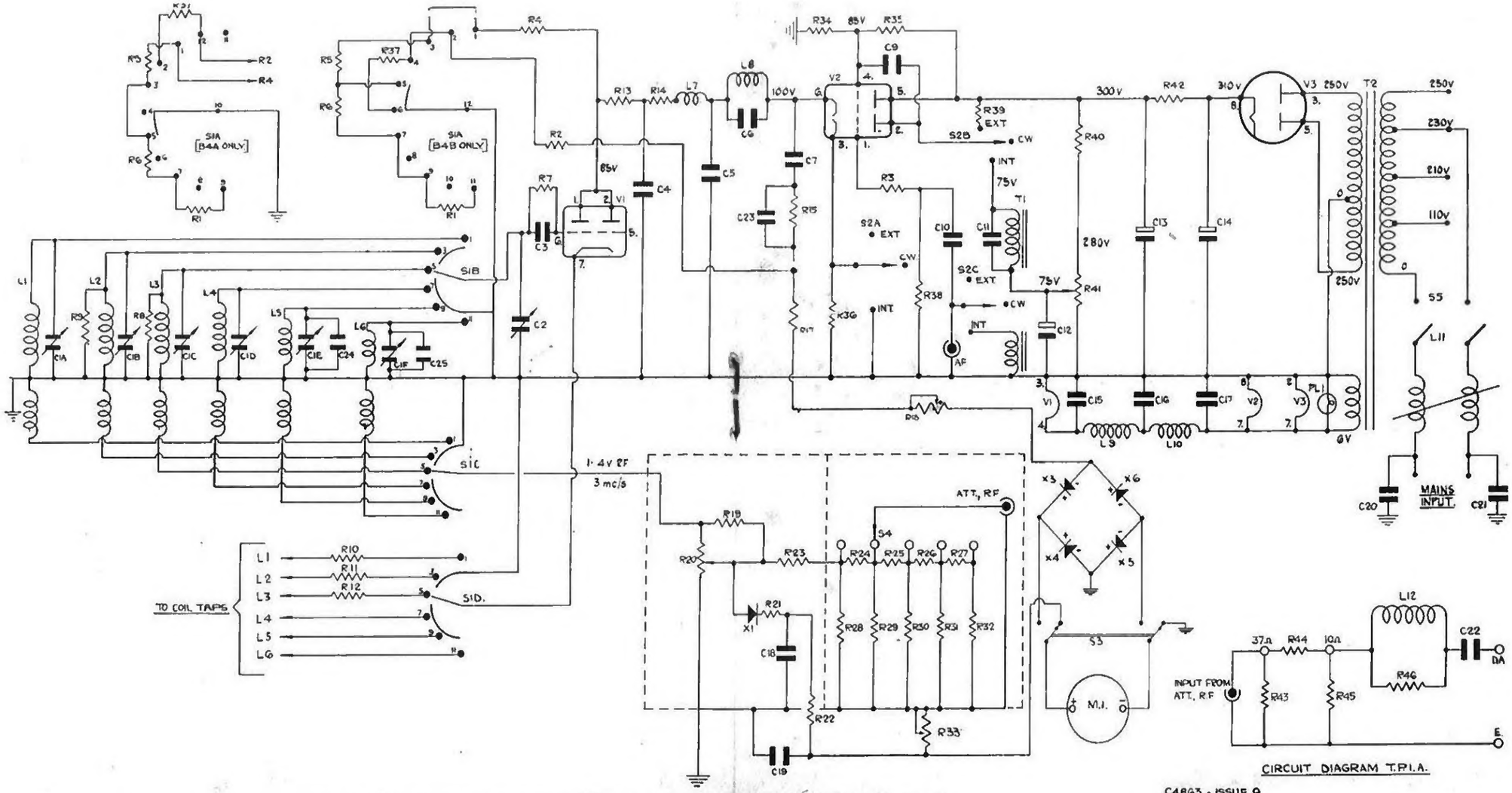
25 lb (11.4 kg) nett

DIMENSIONS

13 in. × 12⅜ in. × 7¼ in. (33·0 cm × 31·4 cm × 18·4 cm)

SPECIFICATION OF TERMINATION PAD TYPE TP1A

Input impedance 75 ohms.
Outputs: 37 ohms at full voltage.
10 ohms giving one-tenth of input voltage.
A standard dummy aerial giving one-tenth of input voltage.
The TP1A is shown on the circuit diagram.



CIRCUIT DIAGRAM T.P.I.A.

C4803 - ISSUE 9

THE RIGHT IS RESERVED TO ADJUST VALUES OR AMEND THIS CIRCUIT WITHOUT NOTICE

REF.	DESCRIPTION RESISTOR	PART No.
R1	15KΩ 10% ½ WATT R.M.A.9	1177
R2	330KΩ 10% ½ WATT	4408
R3	10KΩ 10% ½ WATT R.M.A.9	671
R4	15KΩ 10% ½ WATT R.M.A.8	6381
R5	5·6KΩ10% ½ WATT R.M.A.9	1525
R6	10KΩ 10% ½ WATT R.M.A.9	671
R7	15KΩ 10% ½ WATT R.M.A.9 B4A ONLY	1177
	22KΩ 10% ½ WATT R.M.A.9 B4B ONLY	1271
R8	22KΩ 10% ½ WATT R.M.A.9 B4B ONLY	1271
R9	22KΩ 10% ½ WATT R.M.A.9 B4A ONLY	1271
R10	1K10Ω % ½ WATT R.M.A.9. B4A	1175
	3·3KΩ10% ½ WATT R.M.A.9 B4B	2736
R11	220Ω 10% ½ WATT R.M.A.9 B4A	1272
	1KΩ 10% ½ WATT R.M.A.9 B4B	1175
R12	220Ω 10% ½ WATT R.M.A.9 B4B	1272
	DN B4A CONNECTION IS STRAIGHT TO COIL	
R13	22Ω 10% ½ WATT R.M.A.9	4419
R14	1KΩ 10% ½ WATT R.M.A.9	1175
R15	10KΩ 10% ½ WATT R.M.A.9	671
R17	330KΩ 10% ½ WATT R.M.A.9	4408
R18	250KΩ PLESSEY DO3/5ER Q.C.	1107B
R19	330Ω 10% ½ WATT R.M.A.9	7678
R20	91Ω NON-INDUCTIVELY WOUND PDT.	3754
R21	1KΩ 10% ½ WATT R.M.A.9	1175
R22	1·5KΩ 10% ½ WATT R.M.A.9	4405
R23	240Ω 1% HIGH STABILITY	5797
R24	743Ω 1% ½ WATT High Stability	6249
R25	743Ω 1% ½ WATT High Stability	6249
R26	743Ω 1% ½ WATT High Stability	6249
R27	743Ω 1% ½ WATT High Stability	6249
R28	120Ω 1% ½ WATT High Stability	5798
R29	91Ω 2% ½ WATT High Stability	6250
R30	91Ω 2% ½ WATT High Stability	6250
R31	91Ω 2% ½ WATT High Stability	6250
R32	82Ω 2% ½ WATT High Stability	6251
R33	5KΩ PRE-SET POTENTIOMETER	S884

REF.	DESCRIPTION RESISTOR	PART No.
R34	1MΩ 10% ½ WATT R.M.A.9	1171
R35	2·2MΩ 10% ½ WATT R.M.A.9	1180
R36	5·1KΩ 10% ½ WATT R.M.A.9	7496
R37	680KΩ 10% ½ WATT R.M.A.9	5024
R38	1MΩ 10% ½ WATT R.M.A.9	1171
R39	100KΩ 10% ½ WATT R.M.A.9	1270
R40	5·1KΩ 10% ½ WATT R.M.A.9	7496
R41	100KΩ 4 WATT POTENTIOMETER	7628
R42	1KΩ 10% ½ WATT R.M.A.8	6911
R43	270Ω 1% ½ WATT High Stability	6896
R44	100Ω 1% ½ WATT High Stability	6106
R45	11Ω 1% ½ WATT High Stability	6414
R46	390Ω 10% ½ WATT R.M.A.9	612

REF.	DESCRIPTION CAPACITORS	PART No.
C1	A-F 3-30pF Concentric Trimmers	1620
C2	13-514pF Variable Condenser	7368
C3	100pF SILVERED MICA	7492
C4	200pF 5% Silvered Mica on B4A	7493
	750pF 5% Silvered Mica on B4B	7577
C5	330pF 5% Silvered Mica on B4A	7489
	1200pF 5% Silvered Mica on B4B	7579
C6	220pF 5% Silvered Mica on B4A	7488
	800pF 5% Silvered Mica on B4B	7578
C7	0·5µF 250V. D.C.W. Paper Tub.	10770
C9	0·01µF 350V. D.C.W. Paper Tub.	7491
C10	0·01µF 350V. D.C.W. Paper Tub.	7491
C11	0·01µF 350V. D.C.W. Paper Tub.	7491
C12	8µF 450V. D.C.W. Electrolytic	5921
C13	16µF 350V. D.C.W. Elec. B4A5	7014
	16µF 350V. D.C.W. elec. B4B5	7014
	32µF 350V. D.C.W. Elec. B4A6	7014
C14	16µF 350V. D.C.W. Elec. B4A5	7014
	16µF 350v. D.C.W. Elec. B4B5	7014
	32µF 350v. D.C.W. Elec. B4A6	7014
C15	0·04µF Miniature Metallized Paper	7485
C16	0·04µF Miniature Metallized Paper	7485
C17	0·04µF Miniature Metallized Paper	7485
C18	0·01µF M/M 10% Hunts L6/4 (MLW) H994	5803
C19	0·04µF Miniature Metallized Paper	7485
C20	0·05µF Moulded Mica	1524
	0·005µF 750V. D.C. Moulded Mica. B4A6	7131
C21	0·005µF Moulded Mica	1524
	0·005µF 750V. D.C. Moulded Mica. B4A6	7131
C22	200pF Moulded Mica	7493
C23	300pF Miniature Metallized Paper	7B50
C24	10pF 20% Ceramic Disc. B4A ONLY	4274
C25	10pF 20% CERAMIC DISC. B4B ONLY	4274

REF.	DESCRIPTION	PART No.
L1	Oscillator Coil. 100-300 kc/s B4A	RF 541
	Oscillator Coil. 30-100 kc/s B4B	RF 551
L2	Oscillator Coil. 300-1000 kc/s B4A	RF 542
	Oscillator Coil. 100-300 kc/s B4B	RF 541
L3	Oscillator Coil. 1-3 Mc/s B4A	RF 543
	Oscillator Coil. 300-1000 kc/s B4B	RF 542
L4	Oscillator Coil. 3-10 Mc/s B4A	RF 544
	Oscillator Coil. 1-3 Mc/s B4B	RF 543
L5	Oscillator Coil. 10-30 Mc/s B4A	RF 545
	Oscillator Coil. 3-10 Mc/s B4B	RF 544
L6	Oscillator Coil. 30-80 Mc/s B4A	
	Oscillator Coil. 10-30 Mc/s B4B	RF 545
L7	R.F. Filter Inductance B4A	C123
	R.F. Filter Inductance B4B	C124
L8	R.F. Filter Inductance B4A	C121
	R.F. Filter Inductance B4B	C123
L9	L.T. R.F. CHOKE	C95
L10	L.T. R.F. CHOKE	C95
L11	MAINS R.F. CHOKE	CB3
L12	DUMMY AERIAL INDUCTANCE	
V1	ECC91 (6J6)	7034
V2	65N7 GT.	5B73
V3	6X5GT	3150
X1	Silicon Crystal Rectifier. B.T.H. Type C52A	7110
X3-6 5IA/D	Crystal Diode GE. Westinghouse WG5B R.F. Switch	11538 8332
S2	A.C. MODULATION SWITCH	7382
S3	Meter Switch DP/DT. Bulgin S270 CHR/P	6846
S4	ATTENUATOR SWITCH	A29
S5	MAINS SWITCH	671B
PL1	Pilot Lamp Type ME5 11mm. 6.5v.	B79
T1	MODULATION TRANSFORMER	MT310
T2	MAINS TRANSFORMER INPUT 110-210-230-250 V. 40-100 c/s on B4A5 & B4B5	MT309
	INPUT 117V. 25-60 c/s on B4A6	MT 312
M1	100µA METER	5880

The voltages shown on the circuit diagram were measured on an "Avometer" model 8 [20,000 ohms per volt d.c.]

The 3 Mc/s r.f. measurement was taken on the advance "Advac" a.c. millivoltmeter.

All the measurements were taken with generator set to 3 Mc/s with modulation switched on and set to a depth of 50%

OPERATING INSTRUCTIONS

MAINS VOLTAGE

The B4A and B4B are normally despatched with the mains transformer set to operate at 220 to 240V, a.c. (40–100 c/s). For other supply voltages, withdraw the instrument from its case by unfastening the fixing screws round the edge of the front panel, unsolder the lead on the 230–volt tag on the mains transformer, and re-solder it to the appropriate tapping point.

With the correct mains voltage applied, the instrument can be switched on. Warming up takes only a few minutes.

FREQUENCY

Any frequency in the range of the instrument can be selected to an accuracy of $\pm$ 1% by means of directly calibrated scales and a band selector switch. A linearly calibrated scale with vernier is also provided to enable high accuracy of re-setting to be obtained. If a given frequency is to be required on a number of occasions, the vernier scale reading should be noted, and when re-setting, the instrument should be set to the reading. Fine frequency adjustment is easily obtained using the double slow motion drive which gives a ratio of 25 : 1. When desired, however, the knob on the main dial may be used to swing from one end of the band to the other.

R.F. OUTPUT

The r.f. output into a 75 ohm load, or available at the 37 ohm socket of the terminating pad type TP1A, is variable between 1µV and 100mV by means of a continuously variable control and a 5 position 20 dB per step attenuator. The output voltage is monitored at the input to the attenuator (after the continuously variable control) by a crystal voltmeter with an open scale. This method avoids the frequency errors inherent in the continuously variable control.

To read the output voltage, press the switch marked SET MOD-CW into the CW position. The output voltage available into a 75 ohm load or at the 37 ohm socket of the TP1A is the product of the reading of the meter, which is calibrated 0 to 15, and the setting of the step attenuator marked X1µV, X10µV, X100µV, XImV, X10mV.

For accurate reading at the higher frequencies the output line must be correctly terminated, but up to about 5 Mc/s the output voltage may be doubled with slight error by omitting the termination.

When using the 10 ohm socket or the dummy aerial socket on the termination pad, the output voltage is one-tenth of the indicated output.

INTERNAL MODULATION

The signal can be internally modulated from 0 to 80% at 400 c/s. With the modulation switch set to INT MOD, modulation depth is varied by the MOD control. The modulation depth is monitored when the SET MOD-CW switch is set to MOD. Since the modulation depth is determined by the ratio of modulating voltage to h.t. voltage, it is advisable to maintain accurately the mains input voltage to the generator.

EXTERNAL MODULATION

The signal can be modulated from an external source up to 80%, the acceptable modulation frequencies being 10 c/s to 30 kc/s into the B4A and 10 c/s to 10 kc/s into the B4B. The upper modulation frequency is limited to 1/30th of the carrier frequency. It is desirable that the mains input voltage is accurately maintained so that the metering is accurate. The external modulating signal is injected into the A.F. socket with the modulation switch set to EXT MOD. Input impedance is high and a d.c. blocking capacitor is incorporated.

AUDIO FREQUENCY OUTPUT

A signal is available at the A.F. socket from the internal 400 c/s modulating oscillator when the modulating switch is at INT MOD. Approximately 0 to 10 volts is available into 600 ohms, varied by the MOD control. This output is taken from the secondary winding of the modulation transformer and has a low d.c. resistance to earth.

METER ADJUSTMENT

The monitoring circuits are correctly adjusted before leaving the factory. If after long use they become inaccurate, they can be corrected by means of the preset potentiometers provided. These potentiometers are situated just under the mains transformer.

The most accurate method of adjusting the r.f. metering is by the use of a calibrated crystal voltmeter with input impedance of 75 ohms, which will indicate 100mV. With 100mV into the calibrating meter, the instrument meter reading is adjusted to read 10 (X10mV) An alternative is to adjust the metering at a low r.f. frequency, preferably about 1 Mc/s. The output into a valve voltmeter should be 200mV when the instrument reads 100mV.

The modulation depth indication may be adjusted using an oscilloscope. Care should be taken to avoid errors due to the distortion of the oscilloscope amplifiers. It may be preferred to use the cathode ray tube plates directly, obtaining the deflecting voltage by loose coupling to the tuning capacitor.

Part No. 8347

THE L. & W. PRESS

SIGNAL GENERATOR—TYPE B4AC

Amendments to Handbook

Page 2 Reference to 75 ohms impedance should read 50 ohms.
Page 2 Reference to 37 ohms impedance should read 25 ohms.
Page 3 Termination Pad type TP1A is replaced by TP1C.
Page 3 RF lead PL5 is replaced by PL43.
Page 3 AF lead PL18 is replaced by PL18/C.

Circuit Diagram R43 is 91 ohms PN.372
R23 is 162 ohms PN.362
R24 is 490 ohms PN.365
R25 is 490 ohms PN.365
R26 is 490 ohms PN.365
R27 is 490 ohms PN.365
R28 is 56 ohms PN.364
R29 is 62 ohms PN.363
R30 is 62 ohms PN.363
R31 is 62 ohms PN.363
R32 is 82 ohms PN.6251